

# Is Formal Lifelong Learning a Profitable Investment for All of Life?

## How age, education level, and flexibility of provision affect rates of return to adult education in Colombia

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JEL: I2; J24

### Abstract<sup>1</sup>

*Lifelong learning is increasingly being recognized as a primary factor for knowledge diffusion and productivity growth. However, little economic evidence exists on the economic value of lifelong learning for the individual, especially in developing countries. This paper contributes to remedy this shortfall. It investigates one aspect of lifelong learning: returns to formal education across ages. In the absence of long-term longitudinal data, the paper estimates rates of return for simulated re-entry into the education system. The estimations use the method of internal rate of return and are based on observed education-age-earnings profiles from the Colombian national household survey. We find that rates of return to all levels of education are only slightly smaller for 35 year olds than for young people, thus confirming the profitability of investment in adult education. Tertiary education continues to attract a positive return until late in life, 45-50 years, whereas the economic value of re-entering primary and secondary education is positive up till the age of 40-45. Thus, formal lifelong learning seems to remain a profitable investment for at least half of life. However, lack of part-time work, high tuition fees, and prolonged study time reduce the return. The findings suggest that adult formal education initiatives should focus on the 20 to 40- year olds and be designed flexibly in order to allow learners to work part time.*

World Bank Policy Research Working Paper 3800, December 2005

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<sup>1</sup> The authors thank colleagues from the World Bank: Eduardo Velez Bustillo, Kristian Thorn, Joshua Gallu, Harry Patrinos, Lauritz Holm-Nielsen, and Sergei S. Soares as well as participants at a World Bank Seminar on Lifelong Learning in Latin America and the Caribbean in August 2003 for their valuable comments. Email of corresponding author: [ablom@worldbank.org](mailto:ablom@worldbank.org).

## I - INTRODUCTION

Numerous studies have documented the rising value of human capital in the global economy. Today, most employers require workers to learn skills throughout life. Good formal education is a requirement for being able to continuously learn new skills and adapt to new demands. This paper focuses on estimating the potential value of one of the suggested policy responses to the increased value of human capital, namely lifelong learning. Policymakers in Latin America are increasingly looking to lifelong learning policies to promote continued improvement in a country's human capital stock.

Lifelong learning (LLL) is a concept that stresses the importance of learning throughout life. It encompasses the traditional formal education system (schools, training institutions, universities etc.), non-formal learning (structured on-the-job training) and informal learning (skills learned from family members or people in the community). It advocates that the formal education system should recognize skills acquired outside the system. The focus on learning by the adult population is crucial, because the aging population of most high-and middle-income countries implies that future improvements to the stock of human capital will rather come from continued adult learning than from entry into the labor force of new generations.

Although LLL is still in its concept phase, a growing number of reports examine policies to foster lifelong learning. LLL policies range from curriculum changes towards competency based curricula, participatory teaching, certification mechanisms that recognize learning outside of the formal education system, integration of job training into the education system, regulation of credit transfer between education institutions, and increased educational opportunities for adults. However, there exists little economic investigation on whether such new opportunities really bring value to the individual, firm and country. OECD (2002) and World Bank (2002) summarize the scant research that exists.

This paper contributes to address this shortfall of economic investigation of lifelong learning by examining the value of one element of lifelong learning, formal adult education. We estimate rates of return to formal education for (re-)entry into the education system by age-cohort. This reveals the age at which formal education remains an economically rewarding investment for the individual. We use the methodology of

internal rates of return. Additionally, we examine how part-time work, taxes and tuition fees influence the return to education in order to understand which factors are economically important for the individual in her choice of re-entering the education system or not. We use earnings and education data from six years of household surveys, 1995-2000, and combine it with institutional data. The paper contributes with new knowledge, since a limited number of similar exercises exist for high-income countries, but few for low and middle-income countries.

Our key finding is that the rate of return to education in Colombia remains profitable for the individual for all levels of education up till at least the age of 40, hence half of life. Therefore, there seem to be important gains for adult workers to formal lifelong learning. Further, we find that (i) foregone income critically influences returns; (ii) the length of studies through its impact on foregone income strongly affects returns; (iii) tuition fees reduce returns, in particular for primary and secondary education; and (iv) tax-incentives seem to play only a marginal role for returns to education. The findings suggest that lifelong learning is economically highly rewarding and should in particular target the age-cohorts between 20 and 40 years old.

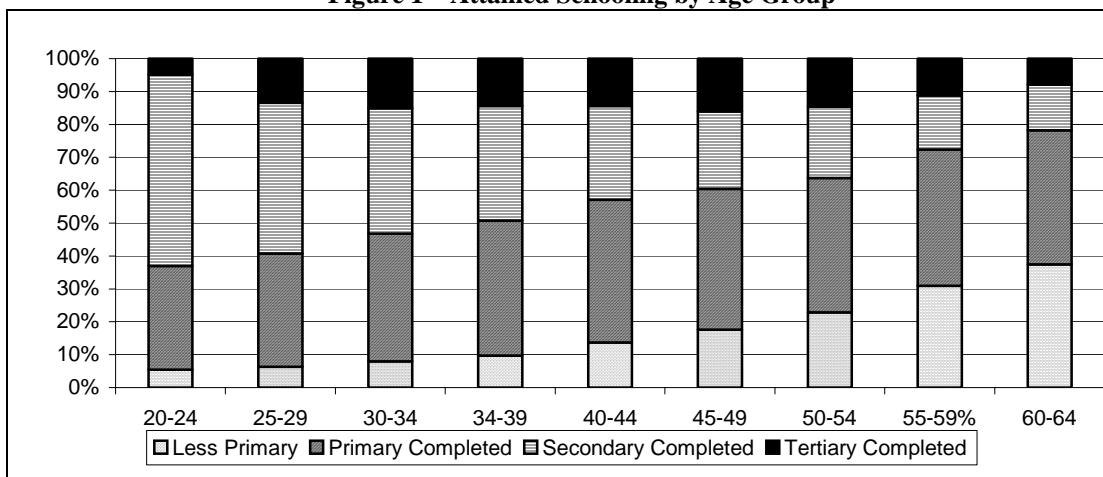
This paper is organized as follows: section II introduces the basic information on school attainment, labor market income, and adult school enrolment to situate the subsequent analysis within its national context. Section III describes the model and methodology of the internal rate of return. Section IV presents and interprets results, while the last section summarizes. A description of the data and detailed estimation results can be found in the annexes.

## II – CONTEXT: SCHOOL ATTAINMENT, EARNINGS AND ADULT ENROLMENT

To understand and assess the analysis of this paper, it is helpful to be familiar with the context. This section briefly introduces school attainment, earnings and adult enrolment.

Many adult Colombians have still not attained primary and secondary education. Further, tertiary education remains relatively elitist. Figure 1 presents attained schooling by age-cohorts of a representative sample of Colombians living in urban areas. It shows both the progress in education over the last two decades and the large share of the population with little schooling. For example, only 20 percent of Colombians above 60 years have completed secondary education. For the age group 35 – 39, only half of the population has completed secondary education. Among the age cohort of 20 to 24 years, almost 40 percent have primary education or less. Extending this analysis to include the rural population would paint a bleaker picture of the gaps in education. Consequently, the majority of the Colombian labor force has still to attain secondary education.<sup>2</sup>

**Figure 1 – Attained Schooling by Age Group**

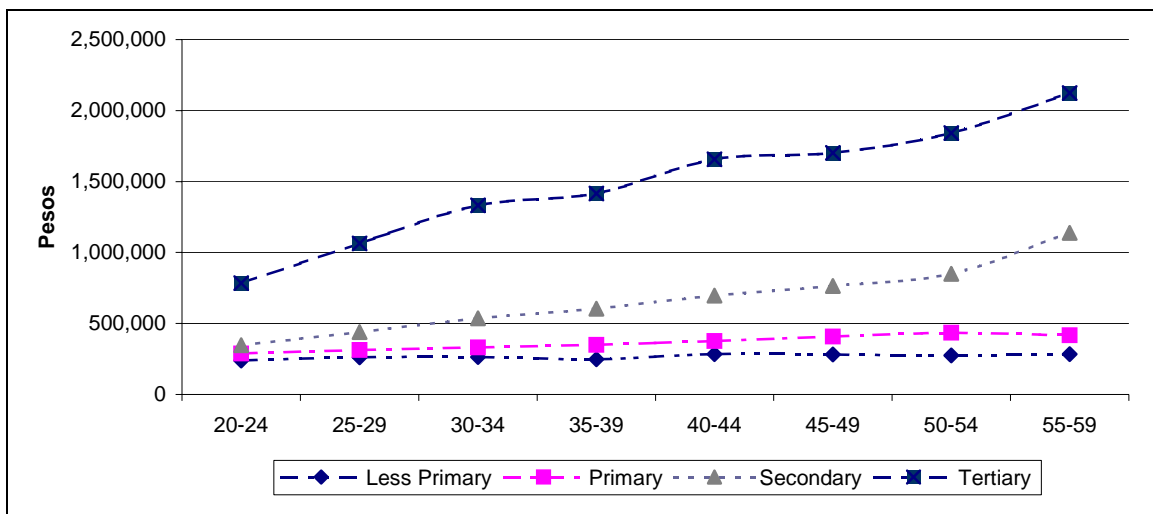


Source: Encuesta de Hogares, 2000

<sup>2</sup> Despite the above shortcomings, it should be noted that the Colombian formal education system expanded greatly during the last two decades. According to the World Development Indicators 2002, preschool gross enrollment grew from 11 percent in 1985 to 35 percent in 1998, primary net enrollment from 66 percent to 87 percent, secondary gross enrollment from 44 percent to 53 percent and tertiary gross enrollment grew from 11 percent to 22 percent. However, 87 percent primary enrollment is not impressive in a region where universal primary education is the standard, and the improvements only benefited today's young generation.

Earnings in the Colombian labor market are, not surprisingly, closely related to a worker's level of education. Figure 2 pictures the average monthly earnings across age cohorts by level of education. It reveals large disparities in earnings between workers with different levels of education. In particular, there is a noticeable wage gap between workers with tertiary education and other workers. Age strongly amplifies the wage difference. Further, there is an almost linear relation between earnings and age for the education and age-groups considered. The large earning gap could suggest a large potential for adult formal lifelong learning.

**Figure 2 - Average Monthly Wage by Age and Education**

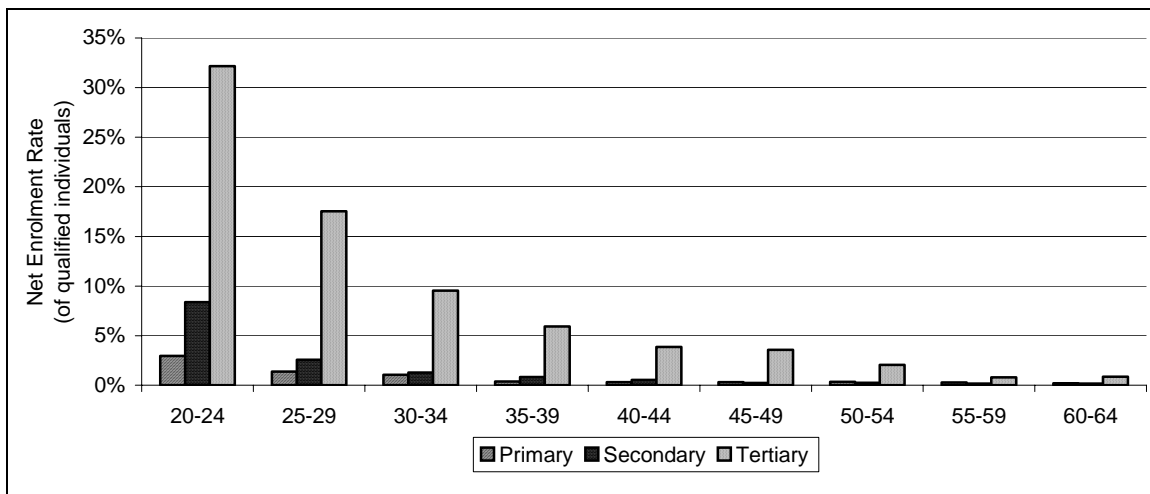


Source: Encuesta de Hogares, 2000

Note: The range on the y-axis spans from US\$ 0 to US\$ 1,200 calculated with the average exchange rate in 2000 of Col\$ 2,088 per US\$.

Few adults are enrolled in education institutions. Figure 3 illustrates enrollment by education level. For each age-cohort, the bar indicates the net enrolment rate. It is calculated as a share of adults in the given age-cohort that attends the indicated level of education out of the potential number of workers that qualify for that level (persons that have completed the level below).

**Figure 3 - Adult Enrollment across Age Groups**



Source: Encuesta de Hogares, 2000

Note: The high tertiary enrollment at age 20-24 includes the fulltime student population that continues directly from secondary to tertiary education.

The figure shows that there is marginal adult enrollment in primary and secondary education above the age of 25, while there is some enrollment in tertiary education up to the age of 50.<sup>3</sup> Many factors could explain the low enrolment. Cultural and national factors, such as poverty, lack of security, economic instability, educational culture and local labor market conditions, surely affect adult enrolment. Further, the education system could be insufficiently geared towards adult education, Holm-Nielsen, Thorn, Brunner and Balan (forthcoming). However, a pre-condition for the success of lifelong learning policies that better accommodates adult learners into the education system is that there are economic gains for the adult population in re-entering the education system. This next section describes the methodology to estimate those gains.

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<sup>3</sup> In an international perspective, a small share of Colombians takes advantage of the high pecuniary gains from tertiary education. Only 0.4 percent of adults aged above 30 are enrolled. This compares to 2.1 percent in Sweden, 1.8 percent in the UK, and 1.5 percent in the US. In a regional context, Colombia also appears to be below average. Argentina (1.3 percent), Brazil (0.6 percent) and Uruguay (0.8 percent) have higher enrollment rates while Peru (0.1 percent) has lower enrolment, OECD (2001).

### III - METHODOLOGY

The additional labor market income that a Colombian worker experiences from upgrading her education level varies tremendously between individuals according to educational, family, professional and socio-economic background, as well as innate abilities and opportunities for future jobs. There are, therefore, numerous methodological considerations to consider when estimating the link between education and labor market income. The two main methodologies are the internal rate of return and wage regressions (mincer approach). We use the internal rate of return to estimate the returns. The reader is referred to Annex 1 for the methodological discussion between the two methodologies and the rationale for choosing the internal rate of return for estimating rates of return in a lifelong learning context.

#### III-1 THE INTERNAL RATE OF RETURN

The internal rate of return is defined as the discount rate that makes the net present value of the future monetary flows (costs and benefits) zero. The discount rate is interpreted similarly to the yield rate on ordinary investments. A positive discount rate means that the investment has a positive return. The best investment will have the highest return. In the case of investment in education, the internal rate of return is the interest rate that equalizes the future flows of additional labor market income from a higher level of education and additional costs from the pursued education. The methodology applied in this paper is similar to that of Blondal *et al* (2002).

In mathematical terms the internal rate of return is the rate of return,  $\delta$ , that equalizes the following economic flows:

$$\sum_{t=\alpha}^{\alpha+l} C_j(t) \times (1 + \delta)^{-(t-\alpha)} = \sum_{t=\alpha+l+1}^{65} Y_j(t) \times (1 + \delta)^{-(t-\alpha)}$$

Where  $t$  indicates years,  $\alpha$  stands for age at the (re-)entrance to the education system,  $l$  represents years spent studying, 65 is the assumed retirement age and index  $j$  indicates the pursued level of education.  $Y_j(t)$  stands for the income function and  $C_j(t)$  symbolizes the cost function including foregone earnings.

The income function,  $Y_j(t)$ , captures the expected post tax extra income gained by completing an education, and is defined as:

$$Y_j(t) = ((W_j \times (1 - u_j) \times g_j^{t-a-l-1}) - (W_{j-1} \times (1 - u_{j-1}) \times g_{j-1}^{t-a-l-1})) \times (1 - \tau)$$

Where  $W_j$  is average income level for an employed newly educated,  $u_j$  is average unemployment,  $g_j$  denotes real income growth rate and  $\tau$  stands for average marginal tax rate. An implicit assumption is that the expected income of unemployed workers is zero.

The cost function  $C_j(t)$  measures lost income from a reduction in time on the labor market due to studies and tuition cost, and is defined as:

$$C_j(t) = (W_{j-1} \times (1 - u_{j-1}) \times g_{j-1}^{t-a} - P_{j-1} \times g_{j-1}^{t-a}) \times (1 - \tau) + T_j$$

Where  $T_j$  is tuition cost and  $P_j$  is part time work.

### III-2 APPLYING THE INTERNAL RATE OF RETURN WITH AVAILABLE DATA

Applying the above model to available data inherently involves some trade-offs. This section describes these trade-offs, the sources of data and the parameters that will form our base scenario for estimating the returns to schooling. Further, we vary the key parameters to observe the impact on the profitability of re-entering the education system. These alternative scenarios will be applied separately to the base case scenario.

The most important constraint for accurate estimations is available data. A longitudinal dataset spanning a lifetime would provide the ideal information to observe the impact of improved education credentials at a point in time of their professional career on labor market earnings. However, such a dataset does not exist for Colombia, and would require around 50 years to establish. In the absence of such a dataset, we estimate the rates of returns by simulating re-entries into the education system. Hence, we estimate foregone income and wage benefits based on the currently observable wage profiles.

For individual data on age, gender, income and education, the study relies on the national quarterly household survey, *Encuesta de Hogares*, from the national institute of statistics, DANE. Unless noted otherwise, the observations are for 6 stacked surveys from September of 1995 to September 2000. To ensure consistency in data the sample is restricted to the seven largest metropolitan areas of Colombia, which cover 67 percent of



the population.<sup>4</sup> For costs of education and taxes, we rely on administrative data. More detailed information can be found in the Annex 2.

The rate of return is calculated for adults at different ages of re-entering the education system starting with adults at the age of 20 ending at the age of 55 with five-year intervals.

### **Benefits from additional education**

Additional income as a consequence of improved formal education depends primarily on value of prior professional experience, unemployment, gender, and marginal tax-rate:

(i) Value of prior professional experience. The value of experience and education is inter-dependent because the embedded level of knowledge accumulated through experience in a job-position is closely tied to the employee's level of education. While a part of job experience, such as integration into a large company, is generic across education levels, other kinds of job-experiences are job-specific, and therefore not valuable in other job-positions. The calculations assume that prior knowledge have some value, namely that an adult completing a degree will have a similar wage growth and similar nominal wage premium as a young graduate. Since the wage premium is added to the wage level the student had before reassuming studies, prior knowledge is given some value. This assumption follows Blondahl *et al* (2002).<sup>5</sup>

(ii) Unemployment. The risk of unemployment varies with age and education. Annex table 3 details the unemployment rate by education level. We also propose an alternative scenario that disregards the difference in unemployment across education levels. This alternative scenario shed light on the impact of unemployment on returns.

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<sup>4</sup> They are Barranquilla, Bogotá, Bucaramanga, Cali, Medellin, and Pasto.

<sup>5</sup> Because of lack of longitudinal data, little is known about how labor markets respond to timing of education. Less ability to learn, less flexibility and a shorter time for companies to reap benefits from the additional education could argue for lower wages for workers that graduated mid-way in life, while experience, and maturity while studying are arguments for higher wages of those mid-life graduates.

(iii) *Gender*. The base case scenario does not distinguish between genders. However, women generally tend to earn less than men. The gains from education therefore differ across genders. We include two alternative scenarios with expected income profiles and unemployment rates for each gender.

(iv) *Income tax*. We use tax-rates from 1997, the mid year for the years of our labor market data. Colombia's top income tax rate was 35 percent, which was payable for yearly incomes over Col\$ 50,200,000 (US\$ 24,000), (Price Waterhouse, 2002). The marginal rate for the average taxpayer ranged from 0.35 percent to 23 percent. For purposes of calculation of extra income a marginal tax rate of 12 percent is applied, whereas high taxation is set to 23 percent. Workers with annual income less than Col\$ 48,600,000 (US\$ 23,300) may choose to deduct either mortgage interest payments, or prepaid medical assistance and educational expenses.<sup>6</sup>

### **Costs from additional education**

The costs of education stem from foregone income while studying, which depends upon the length of study time, and tuition fees:

(i) *Foregone income from studying*. Studying takes up time, which will reduce time for work. According to the household survey, 75 percent of adult students are employed. On average, they work 6 hours less per week than adults not attending education. Annex table 4 presents the average wage per hour for studying workers and non-studying workers. This suggests that time for studying is predominantly taken out of leisure time as opposed to working time. Based on this information, the base case scenario assumes that foregone income for time dedicated to studies amounts to 14 percent of the average monthly salary; equal to 6 hours out of the average weekly 43 working hours.<sup>7</sup>

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<sup>6</sup> The marginal tax rate only influences the rate of return in case the tax rate for foregone income differs from the tax rate for extra income or if tuition is paid and deducted.

<sup>7</sup> The cost of studying in terms of foregone income rises with age. We implicitly assume that the value of lost leisure time is zero. As an alternative scenario, we estimate the return to education for workers with no income during studies, which is applicable for fulltime students with no job or if we account for the value of lost leisure time.

(ii) Study time. Given the high proportion of adult students that work close to full time while studying, the base case scenario assumes that studies are prolonged by two years beyond the norm length. This implies that the study time is 7 years, 8 years and 7 years for primary, secondary, and tertiary education, respectively. The extra study time is understood not to entail additional tuition fees. An alternative case scenario assumes a timely completion of the education cycle (5 years, 6 years, and 5 years for primary, secondary, and tertiary education, respectively).

(iii) Tuition. Most courses of primary and secondary education are provided free of charge. At the tertiary level, 29 percent of classes are provided by public institutions at the price of around 20 percent of the real costs. Substantial price differences exist between public and private institutions. Annex table 5 details tuition fees in primary, secondary and tertiary education. In the base scenario, students in primary and secondary education are assumed not to pay tuition, while students in tertiary education is assumed to pay yearly tuition fee of Col\$ 2,148,000 (US\$ 1,030), which was the average tuition fee in 1998, World Bank (2003b). As an alternative to the base scenario, we estimate the return if lifelong learners in primary and secondary education had to shoulder the full costs of the classes, Col\$ 553,000 (US\$ 265).

Annex table 6 gives an overview of the assumptions made in the base case scenarios and the alternative scenarios.

The above list of factors influencing benefits and costs reflect the main costs and benefits from re-entering the education system. These are included in this study. Nevertheless, other factor deemed less important have not been taken into account, such as student financial support, social transfers, costs of education other than tuition fees, variation in retirement age, non-pecuniary benefits from education, and the option value of education.<sup>8</sup>

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<sup>8</sup> The main option value of a completed education is that it gives access to the next level. Annex 3 summarizes the possible bias from omitted factors.

### III-3 METHODOLOGICAL CAVEATS FOR INTERPRETATION

As always when complex processes are simplified, caution is required for interpretation. The following paragraphs describe four caveats for interpretation:

(i) The IRR heavily discounts long-term gains from investments. In instances with high rates of return, the IRR method heavily discounts long-term gains thereby giving income in the far future little weight. In financial terms, this may be warranted as time carries a high cost. But policymakers may be just as concerned with current welfare as welfare 50 years from now. A less heavy discounting of income in the far future would increase the rates of return, especially for young people. To observe the implication of using a different methodology, we also show the net present value of investing in education at different ages given a constant discount rate.<sup>9</sup>

(ii) The discount rate is assumed identical for education costs and extra income. This would be true in a perfect credit market. However, the market for credit is riddled with market failures due to asymmetric information. Therefore, upfront costs may come at a higher cost than additional income, extending to the infinite for young and poor people without access to credit. This could give an overestimation of the returns to schooling.

(iii) Innate ability as well as family and educational background is omitted. The IRR estimates are based on expected growth of average income. A large strand of literature examines the causal effects between individual returns to schooling, innate ability, social background and the choice of attending education. The essential question to be answered is to which extent the observed higher income from education is caused by underlying individual factors that influences the individual to seek more education. So far, there exists no convincing evidence to answer the question.

(iv) Returns are private returns and not social returns. We estimate the return to education to the individual and not to the society. Preferably, policies should be based on

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<sup>9</sup> The method of internal rate of return is closely related as to the method of net present value (NPV) as the calculated internal rate makes the NPV zero. With the net present value, the discount rate is fixed a priori and assumed constant. Thereby, the NPV can deviate from zero.

social returns taking into account externalities. Since externalities from education are in general positive, the inclusion of externalities would increase the returns.

#### IV- FINDINGS

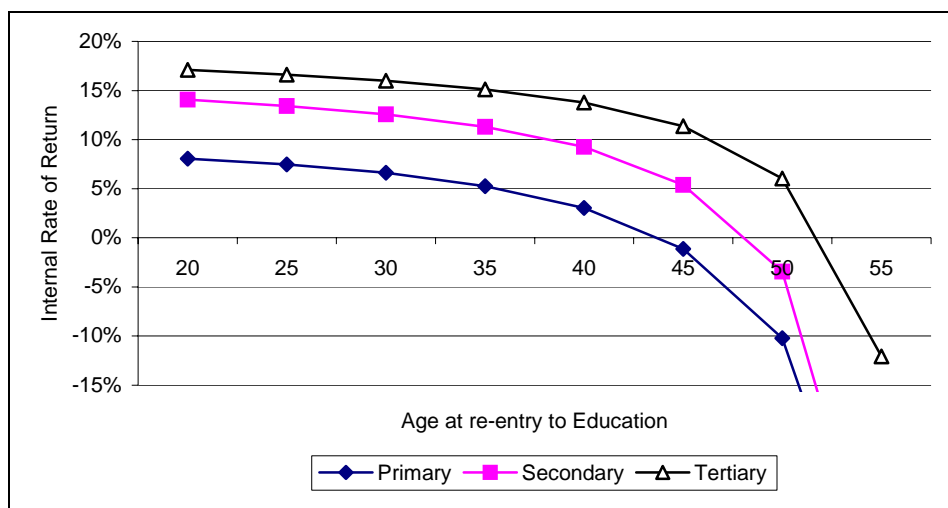
This section presents the estimated returns to education. First, it describes the rates of return in the base case scenario that best answers the title question on profitability of formal lifelong learning. Second, we discuss how various individual and educational factors affect the gains from re-entering the education system.

##### IV-1 HOW AGE AFFECTS RETURNS TO FORMAL LIFELONG LEARNING

Based on the base-case scenario, we find high rates of return to re-entering the education system. For a 20 year-old, the returns to primary, secondary and tertiary education are 8 percent, 14 percent, and 17 percent. On an international scale, these returns are quite high, and point to the need for continued strong emphasis on investment in education and further reforms to facilitate access to education.

The returns differ across education levels. The return to tertiary education exceeds that of secondary education by three percentage points and primary education by 9 percentage points. This pattern of rising return to schooling is similar to that of several of the other major Latin American countries, Sanchez-Paramo and Schady (2003). The driving force is primarily a rising demand for highly skilled labor with which the education system has not been able to keep pace.

**Figure 4 - Rates of return to education by age (base scenario)**



Source: Authors' calculation based on Encuesta de Hogares 1995-2000

Note: Annex table 7 presents the full estimation results

The rates of returns gradually decline with the age of workers (See Figure 4). The rates are persistently positive up to a high age. The rates do not decline linearly, which is due to the heavy discounting of income in the far future. Given we fixed the retirement age at 65, the change in returns for 20 year-olds as compared to 25 year-olds reflects the discounted value of the salary received in the 40<sup>th</sup> to the 45<sup>th</sup> year on the labor market. Because of the high discount factor, the present day value of labor market income this far in the future is small. Therefore, the return only declines moderately from the age of 20 to 25, 3 percentage point, 3 percentage points and 2 percentage points for primary, secondary, and tertiary education, respectively.

The findings suggest that formal learning remains a profitable investment up till at least the age of 35-40, hence half-life. Caution is warranted when interpreting the results, since the estimations are based on simulated re-entries into the education system. Nevertheless, the high rates of return indicate that education seems to continue to be a high yielding investment at least up to the age of 35, hence beyond the traditional school age. Beyond the age of 35, primary education still yields a positive return, albeit the return declines rapidly. Secondary and tertiary education remain profitable to the age of 45 and 50, respectively. For 50 year-olds, the return to formal learning education turns negative.

For tertiary education, the returns remain above 10 percent to the age of 45. Therefore, this sub-sector should in particular be geared to include adult learners.<sup>10</sup>

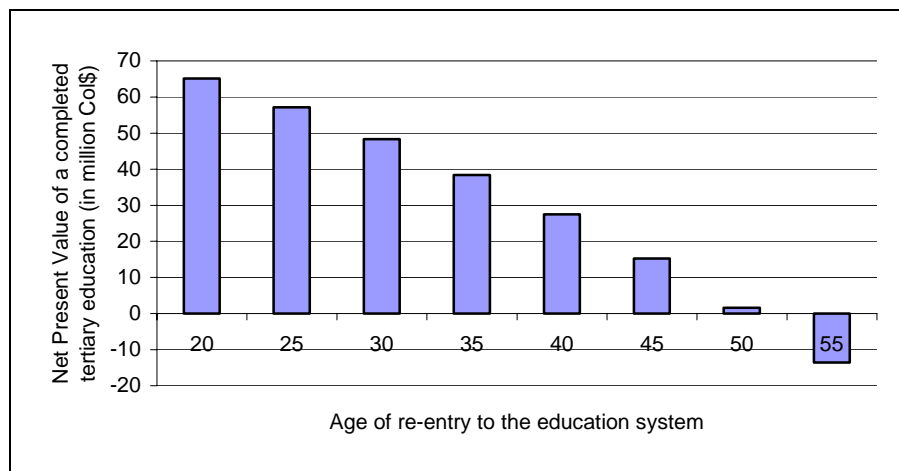
Although the rate of return does not decline much in the first years, it is important to emphasize that finishing an education degree early in life is still much more valuable.

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<sup>10</sup> The internal rates of return confirm a previous study that found that the return to education rises with the education level. Blom and Hansen (2002) find returns of 5.4 percent to 8.6 percent in recent years for primary, 6.8 percent to 7.7 percent for secondary and 14.2 percent to 19.1 percent for tertiary. In contrast, Psacharopoulos and Patrinos (2002) find higher returns to primary education (20 percent), lower returns for tertiary (14 percent) and returns more in line with this study for secondary (11.4 percent). Both studies used Mincer methodology. In an international comparison, the rates of return to tertiary education in Colombia is at the level of returns in the US and UK and significantly above the return to tertiary education in the majority of the high-income countries in Europe. Annex 4 compares this paper's findings with similar findings for a group of OECD countries available in Blondal *et al* (2002).

The rate of return is calculated at the moment the investment in education takes place. The estimated returns reflect choices facing individuals at different ages (20, 25, etc) of whether to re-enter the education system. Hence, the returns do not simulate the situation of a 20 year-old facing a choice of continuing education now or re-enter the education system at the age of 25, 30 etc. To illustrate the gains from completing an education degree early in life, we computed the net present value of a tertiary education with a constant discount rate of 5 percent—a level above the current world real interest rate. Figure 5 shows that finishing an education early in life yields a higher value.

**Figure 5 - NPV across age for tertiary students**



Source: Authors' calculation based on Encuesta de Hogares 1995-2000

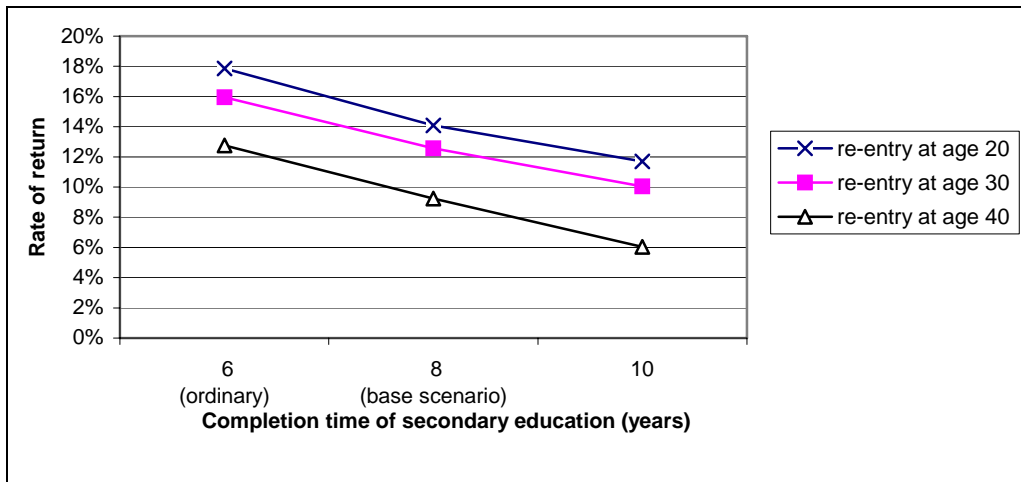
#### **IV-2 HOW INDIVIDUAL AND EDUCATIONAL FACTORS AFFECT THE RATE OF RETURN; ALTERNATIVE SCENARIOS**

Individual and educational factors significantly affect the rate of return. Below, we outline the main findings from the alternative scenarios. By changing the assumptions behind the baseline case, we can observe the sensitivity of the return to education to: study completion time, part-time work, public subsidies to tertiary education, tuition fees for primary and secondary education, unemployment and tax legislation. Further, we examine the returns by gender. The paragraphs below discuss each factor. The full estimation results are available in Annex table 7.

Study completion time. Foregone income from studying critically affects the rate of return, even though students on average work 86 percent of a full working week. Figure 6 shows how two extra study years decrease the returns to secondary education for a 30

year old from 16 percent to 12.5 percent. Further two years of study would shave additional 2.5 percent off to 10 percent. For primary education (not showed), the extra study time costs 3 percent points, and for tertiary education (not showed) close to 5 percent points. For comparison, additional time to complete a degree affects returns more than the difference in re-entry age to the education system from 20 to 30 years of age.

**Figure 6 - How study completion time affects returns to secondary education**



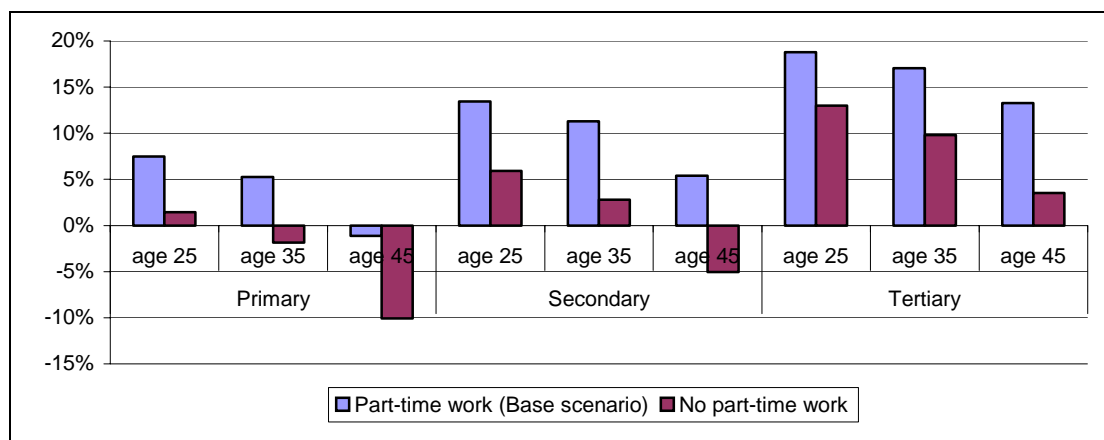
Source: Authors' calculation based on *Encuesta de Hogares* 1995-2000

Note: Secondary education ordinarily consists of 6 years of fulltime classes

*Part-time work.* The alternative scenario that adult learners do not work part time—and complete the studies on time—reveals the decisive importance of foregone income. For primary education, the “breakeven age”—the age where the return is zero—falls by almost 15 years to the age of 30, Figure 7. It becomes unprofitable for a 30 year-old to complete primary education if there is no possibility of working part-time. At the secondary level the breakeven age declines by ten years to 40, while for tertiary education, the break-even age only decreases by 5 years to the age of 50.



**Figure 7 - Impact of part time work on returns to education**



Source: Authors' calculation based on Encuesta de Hogares 1995-2000

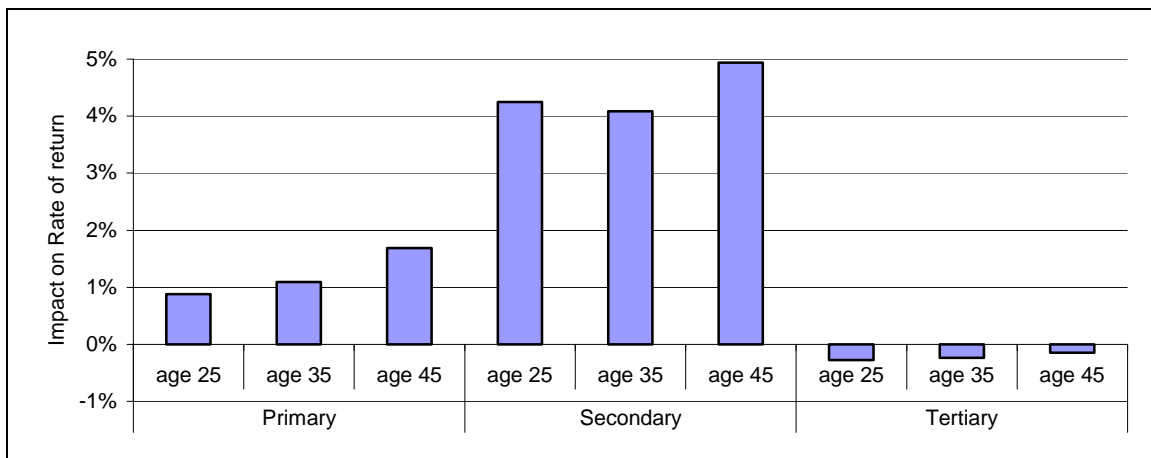
**Tuition.** If adult learners have to pay for primary and secondary education, the return is diminished by three percent points for primary and secondary education (for a 35 year old). This is a reduction of around 67 percent for primary education and 31 percent for secondary education. This scenario can also be interpreted as the impact of private cost of education other than tuition that is not included in the calculations, such as school supplies and transportation. For tertiary education, the base scenario assumes full tuition. In the case of students attending public tertiary institutions, where tuition fee amount to only 20 percent of the full costs, the return to increases by 11 percentage point compared to the base case scenario of full tuition costs. This represents an increase of 68 percent. The robust return equally prevails for an adult student. A 45 year-old would receive a return of more than 20 percent.<sup>11</sup>

**Unemployment.** Unemployment affects the return through two channels: (i) the expected income increases for workers prior to entering education and after the completion of a higher level of education. Therefore, there is a level effect; and (ii) the return changes according to the relative difference in unemployment between the previous level of

<sup>11</sup> Tuition fees affect returns to tertiary education more in Colombia than in OECD countries. In the OECD, the average return decrease by approximately 2 percentage point, see Annex 4: International Comparison.

education and the new level. This is a relative effect. The return to primary education increases by 1 percentage point, Figure 8. With no unemployment, the return to secondary education increases substantially, 4 percentage-points. This is a result of the positive level effect strengthened by a positive relative effect. Workers with secondary education suffer most from joblessness in Colombia. The return to tertiary education decreases by a half percentage point as the relative unemployment effect (compared to secondary education) dominates, since graduates with secondary diploma tend to face higher unemployment than graduates with a tertiary diploma. The findings show that if the unemployment rate declines in Colombia, the return to secondary education would in particular increase.<sup>12</sup>

**Figure 8 - Impact of Unemployment on Rates of Return**



Source: Authors' calculation based on Encuesta de Hogares 1995-2000

**Taxation.** The tax rate only influences the rate of return if costs or benefits are taxed differently. In our base scenario, only returns to tertiary education changes with the tax rate as we assume that tuition cost cannot be deducted. The impact of taxes seems marginal for the returns to education. The impact of paying the top marginal tax rate of 23 percent compared to paying no taxes does not exceed 2 percent-points. The reduced impact and the already existing option of tax deduction of educational costs could

<sup>12</sup> In contrast to the Colombian labor market, no unemployment increases returns to tertiary education for the five OECD for which we have data, see Annex 4.

indicate that this policy instrument for promotion of private investment in education appears to be marginal in its classical form.<sup>13</sup>

Gender. We find returns to education to be higher for men than for women. The gender difference affects returns to secondary education the least (less than 1 percentage point), the most on primary education (4 percentage points), while the gender difference for tertiary education is around 3 percentage points. The difference declines with age. The gender difference is rooted in higher hourly wage, more working hours, and a lower unemployment ratio for men.<sup>14</sup>

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<sup>13</sup> Income taxes more effectively impact the return to tertiary education in the OECD countries than in Colombia. This is expected given the higher taxes in the majority of the OECD countries compared to Colombia. The average return in the OECD decreases by 1.5 percentage point, see Annex 4.

<sup>14</sup> The affect of gender on returns to tertiary education is greater in Colombia than in the OECD. In the OECD, the average gender difference is 1 percentage point, see Annex 4.

## V- SUMMARY OF FINDINGS AND POSSIBLE IMPLICATIONS FOR LIFELONG LEARNING POLICIES

**This paper seeks to contribute to the existing knowledge of economic analysis on lifelong learning.** We compute rates of return to formal adult education by simulating the wage benefits and costs for workers choosing to re-enter the education system. By using the observed education-age-earnings profiles and the method of internal rates of return, we provide estimates of the internal rate of return to education across ages. Lack of long-run longitudinal data on education and earnings prevents the study from examining actual cases of the impact of re-entering the education system. Nevertheless, the methodology yields an insight into the potential value of policies to increase formal lifelong learning.

**We find that rates of return to education remain profitable for the individual for all levels of education up till at least the age of 40, hence half of life.** The return is 5 percent, 11 percent, and 15 percent for workers at the age of 35 who re-enter primary, secondary, and tertiary education, respectively. These are “only” 2-3 percentage points below the return to 20 year-olds. Return to primary education exceeds the average real interest rate (3 percent) up to the age of 40. Secondary education continues to attract a medium return (5 percent) until the age of 45, while tertiary still attracts a medium return, 6 percent, until the age of 50. Further, the returns exceed the rates found in most OECD countries. Hence, there seems to be important gains from policies that facilitate and encourage adult workers to pursue formal lifelong learning. For such policies the following findings regarding factors that affect the return could serve as a guide:

**Foregone income critically influences the returns.** If part-time work is incompatible with attending courses, the returns to primary, secondary and tertiary education for a 35 year-old worker decline by 5-7 percentage points. This turns primary education into an economic net loss, while secondary and tertiary education attract a positive return of 3 percent and 10 percent, respectively. The high costs of foregone income imply that adaptation of courses to the needs of working people is critical to induce adults to pursue further education.

**The length of studies through its impact on foregone earnings strongly influences the returns.** Protracting completion of education by two years shaves 3-4 percent off the returns. Consequently, policies that reduce study time would raise the return. Such

policies include accreditation and certification frameworks that recognize prior learning and informal learning. Also, establishing flexible credit transfer policies on an institutional, national or supra-national level would reduce study time for the large share of students that changes either education institution or study discipline, since they could receive credits for courses taken elsewhere.

**Tuition fees affect returns in the magnitude of 3 to 4 percent.** This is especially the case for primary and secondary education. For tertiary education, the tuition is less important, since foregone income is by far the most important factor. Therefore, flexibility of provision and policies to overcome financial constraints to soften the impact of foregone income seem relatively more important at the tertiary level.

**Tax incentives seem to play only a marginal role for returns to education.** Tax rebates are therefore unlikely to be a major policy instrument for formal lifelong learning in developing countries.

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## ANNEX 1

The following annex describes the two main methodologies used to estimate private returns to education. Two methodologies are traditionally used to estimate returns to education:<sup>15</sup>

- i. *Estimation by wage regressions* (Mincer approach). The Mincer approach relates the logarithm of earnings to attained schooling and accumulated work experience by use of regression techniques.
- ii. *Calculation of the internal rate of return*. The internal rate of return determines the interest rate that equals the stream of benefits and costs involved in education.

The regression methodology is less demanding on data and is easily applicable to household and labor market surveys. Therefore, this earnings regression method is widely applied. Given a set of assumptions, the coefficient to the variable indicating a person's attained schooling can be interpreted as the (average or marginal) rate of return to education. These assumptions are however important to keep in mind when interpreting rate of returns from earnings functions as they are not always fulfilled. The six crucial assumptions for interpreting the coefficient to education in a wage-regression as a return to investment are:

- (i) *All schooling precedes work*. For estimating the return to formal education for adults that re-enter the education system, this assumption would lead to significant distortions.
- (ii) *The length of working life is independent of the length of schooling*. If this must hold and work life is assumed to be 45 years, a student leaving school at the age of 15 retires at age 60 and a student leaving school at age 25 retires at age 70. This assumption is bound to be broken when analyzing return to education for adults reentering education. If not broken, a 35 year-old entering tertiary

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<sup>15</sup> For an introduction to these methods see Psacharopoulos (1994).



education would retire at age 85 and a 45 year-old pursuing tertiary education would retire at age 95.

- (iii) *The earnings function is separable in schooling and experience implying that the return to experience is independent from the level of education.*<sup>16</sup> The assumption implies that the log (real) wage experience profiles are parallel across schooling levels. Basically, this assumption implies that the value of one extra year of job experience of a street vendor is equal to the value of one extra year of job experience for a surgeon. Given knowledge intensive jobs are expected to carry a higher return to experience, it is plausible that additional education increases the return to experience. Therefore, schooling and job-experience appear to be inseparable, contrary to the assumption. Heckman et al. (2003) statistically test the assumption on US data. They find that the assumption might have been valid for the available US-data at the time when the Mincer-regression methodology was developed (1970s). However, the assumption is not valid for recent data.
- (iv) *The only costs of schooling are foregone earnings.* In the case of Colombia, this assumption could distort the estimate significantly. For a large share of the population, the cost of education presents an obstacle for re-entering the education system. Especially, tertiary education can be prohibitively expensive. Yearly tuition amounts to the equivalent of 80 percent of GDP per capita, World Bank (2003b).
- (v) *The age-earning-education profiles remain constant over the lifetime of an individual.* This is contradictory to the empirical evidence. Various papers document a rise in the skill premium to tertiary education over the last two decades, Card and Lemieux (2000) and Blom and Velez (2001). The assumption corresponds to an implicit assumption of perfect certainty of future earnings.

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<sup>16</sup> An assumption derived from an assumption of identical post school investments across individuals and educational levels. See full argument in Mincer (1974)

However, the rate of return can be interpreted as best ex-ante estimation under the assumption that future changes in age-earning-education profiles are random.

- (vi) *The tax rate is constant across income levels.* Within a progressive tax-system, higher taxes for high earners reduce the incentives for education. Ignoring a progressive tax rate would hence over-estimate the private returns to education.

Some evidence exists of the severity of bias introduced by these strict assumptions. Based on comparison between a methodology developed by Hanoch and the Mincer approach, Heckman *et al* (2003) looks into the size of some of the inherent biases that arise when the Mincer regressions are interpreted as internal rates of returns. They find small to medium biases in the magnitude of 3-4 percent-points in the rate of return.

In general, the internal rate of return (IRR) does not rely on a similar set of assumptions. As such, it is a superior technique to that of earnings function as IRR allows for a better treatment of direct and indirect education cost and benefits. However, the IRR requires greater access to costs of education and other kinds of administrative data that are typically not available in household surveys.<sup>17</sup> Given this paper's focus on returns to lifelong learning, the inherent shortcomings from using the Mincer-approach were deemed too distorting, and, consequently, we rely on the more cumbersome, but less distorting method of internal rates of return.

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<sup>17</sup> The problem of estimating future earnings for today's student based on ex ante information however remains.

## ANNEX 2

This Annex summarizes the data used in the calculations, an overview of the alternative scenarios and the full estimation results.

Educational levels are computed from attained years of schooling as follows:

Education level	Years of schooling
Less Primary	Less than 5 years of education
Primary Completed	Between 5 and 10 years of education
Secondary Completed	Between 11 and 15 years of education
Tertiary Completed	More than 16 years of education

Data for internal rate of return calculations:

**Annex table 1 – Start Incomes for Young Newly Educated ( $W_j$ )<sup>18</sup>**

	Less Primary	Primary	Secondary	Tertiary
All	Col \$2,930,074	Col \$3,091,583	Col \$3,636,756	Col \$8,589,223
Male	Col \$3,091,617	Col \$3,382,477	Col \$4,092,941	Col \$11,025,147
Female	Col \$2,715,536	Col \$2,663,612	Col \$3,188,811	Col \$7,231,767

**Annex table 2 – Growth Rates of Income ( $g_j$ )**

	Less Primary	Primary	Secondary	Tertiary
All	0.51%	1.20%	2.89%	2.84%
Male	0.83%	1.38%	3.11%	2.42%
Female	-0.14%	0.70%	2.20%	2.23%

**Annex table 3 – Unemployment Rates ( $u_j$ )**

	Less Primary	Primary	Secondary	Tertiary
All	12.1%	13.8%	15.3%	8.2%
Male	10.8%	10.4%	11.3%	6.7%
Female	13.8%	18.4%	19.7%	9.9%

**Annex table 4 - Wage, Employment and Work Hours for Students**

		Less Primary	Primary	Secondary	Tertiary
Wage an Hour	Enrolled	\$ 1,509	\$ 1,865	\$ 2,888	\$ 7,697
	Not Enrolled	\$ 1,460	\$ 1,881	\$ 3,436	\$ 6,815
Hours Worked a Week	Enrolled	48	49	48	45
	Not Enrolled	42	38	41	42

<sup>18</sup> All income data has been inflated to year 2000 pesos.

Annex table 6 shows the costs used in the calculations. For primary and secondary the yearly public cost is Col\$ 604.150 for primary education and Col\$ 466.696 for secondary education. Most education at these levels are provided free of charge. For tertiary education, the average fee for all private tertiary education programs is applied, World Bank (2003b).

**Annex table 5 – Education Cost (T)**

Primary	Secondary	Tertiary
Col\$553.506	Col\$553.506	Col\$ 2,148,366

**Annex table 6 - Assumptions under each Scenario**

Scenario	Study completion time (in years)		Tuition		Part-time work		Unemployment		Wage data		Marginal tax	
	Primary: 5 Sec: 6 Tertiary: 5	Primary: 7 Sec: 8 Tertiary: 7	Pri and Sec: Full costs Ter: 20% of costs	Pri and Sec: no tuition Ter: Full costs	No	Yes	Excluded	Included	Split by gender	No split	High tax (23 %)	Av. Tax (12%)
Base		•		•		•		•		•		•
<b>Alternative scenarios</b>												
Study time	•			•		•		•		•		•
Tuition		•	•			•		•		•		•
No part-time work	•			•	•			•		•		•
Unemployment		•		•		•	•			•		•
Gender		•		•		•		•	•			•
High tax		•		•		•		•		•	•	



### Annex table 7 – Full Estimation Results

To read the absolute return from any scenario, the return under the base scenario is added to the alternative scenario. For example the return when disregarding unemployment for a primary 35-year-old student is: 6.4 % (= 5.3 % + 1.1 %).

Rates of Return	Age of re-entry							
	20	25	30	35	40	45	50	55
<b>Primary</b>								
Base	8.1%	7.5%	6.6%	<b>5.3%</b>	3.0%	-1.1%	-10.2%	-39.2%
Male	1.1%	1.1%	1.1%	1.2%	1.4%	1.8%	2.7%	5.6%
Female	-2.9%	-3.0%	-3.3%	-3.8%	-4.7%	-6.8%	-12.9%	-
On time and no work	-5.7%	-6.0%	-6.5%	-7.1%	-7.9%	-8.9%	-9.9%	-6.7%
Tuition (included)	-3.0%	-3.1%	-3.3%	-3.5%	-3.9%	-4.3%	-4.8%	-4.0%
Study time (shortened)	2.7%	2.6%	2.6%	2.6%	2.8%	3.2%	4.3%	8.3%
Unemployment (excluding)	0.8%	0.9%	1.0%	<b>1.1%</b>	1.3%	1.7%	2.5%	4.5%
<b>Secondary</b>								
Base	14.1%	13.4%	12.6%	11.3%	9.2%	5.4%	-3.4%	-37.9%
Male	0.9%	0.9%	0.9%	0.8%	0.8%	0.9%	1.1%	2.0%
Female	-0.2%	0.0%	0.2%	0.5%	0.9%	1.5%	2.6%	6.0%
On time and no work	-7.2%	-7.5%	-7.9%	-8.5%	-9.3%	-10.4%	-11.6%	-5.3%
Tuition (included)	-3.5%	-3.5%	-3.4%	-3.5%	-3.6%	-3.8%	-4.0%	-2.5%
Study time (shortened)	3.8%	3.5%	3.4%	3.4%	3.5%	4.0%	5.5%	15.3%
Unemployment (excluding)	4.5%	4.2%	4.1%	4.1%	4.3%	4.9%	6.7%	17.5%
<b>Tertiary</b>								
Base	17.1%	16.6%	16.0%	15.1%	13.8%	11.4%	6.0%	-12.1%
Male	2.3%	2.2%	2.0%	1.9%	1.9%	1.9%	2.1%	2.4%

Female	-1.2%	-1.0%	-0.8%	-0.5%	-0.3%	0.1%	0.6%	1.9%
On time and no work	-2.8%	-3.6%	-4.4%	-5.3%	-6.4%	-7.9%	-10.0%	-13.0%
Tuition (20% of costs)	11.5%	10.7%	10.0%	9.4%	9.0%	8.9%	9.4%	10.4%
Study time (shortened)	4.8%	4.3%	3.7%	3.2%	2.8%	2.3%	1.9%	1.0%
Unemployment (excluding)	-0.3%	-0.3%	-0.3%	-0.2%	-0.2%	-0.1%	-0.1%	0.1%
High tax	-1.0%	-0.9%	-0.8%	-0.7%	-0.6%	-0.4%	-0.2%	0.4%

Note: When data is split with separate expected additional income and foregone income for male and females each gender have a higher yield than the weighted average for the entire population. This is due to a different timing of cost and earnings for each gender.



### ANNEX 3

This annex briefly discusses how omitted factors in the rates of return estimations could affect the estimates:

*Student financial support.* Financial support reduces the costs of education to the extent that it involves a subsidy.<sup>19</sup> Thereby support can increase the private gains from education, see OECD (2003) for an account. However, unsubsidized student loans do not affect returns, they merely defer the costs of studying to be incurred concurrently with the benefits from improved education. As such, unsubsidized loans improve the functioning of the education market and facilitate access to education. Omitting student financial support in the case of Colombia is unlikely to significantly bias the results, since less than 8 percent of students receive student loans and around 80 percent of financial aid is repaid, ICETEX (2003).

*Social transfers.* Unemployment, social and retirement benefits often increase with educational levels. Excluding these benefits from the analysis could result in a downward bias in the estimations.

*Other cost of education than tuition.* School supplies and transportation amount to important costs for poor households (World Bank, 2002). This omission would tend to over-estimate the return.

*The retirement age increases with education.* Higher educated individuals tend to remain in the labor force for longer time. The assumption of fixed retirement age would tend to under-estimate the returns.

*Non-pecuniary benefits from education.* It is well documented that with more education follows a series of not directly measurable gains, such as better health.

*The option value of education.* Completion of primary and secondary education provides the graduate with the option of pursuing the next level of education. Depending upon the

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<sup>19</sup> The internal rate of return is also affected if the interest rate is not identical to the discount factor.

probability of accessing the subsequent level of education, the option value increases with the value of education.

*Ex-ante and ex-post returns.* By using existing returns to education to project future returns for new students, we implicitly assume that the educational premium is static over time and that the return to experience equally is constant. Although, the future changes in skill premiums to a certain extent can be predicted by computing the expected changes in supply of skills, the demand for skills depends upon the skill-bias of future production technologies, which is unknown. The future changes in education-experience-earnings profiles are therefore uncertain.

#### ANNEX 4 INTERNATIONAL COMPARISON

This annex compares the impact of age, taxes, unemployment, gender and tuition in an international context. We use results from Blondahl et al (2002). For the purpose of comparison, the rates of return for Colombia shown in this annex do not take into account the value of part-time work to ensure comparability with estimates from Blondahl et al (2002) that excludes labor market earnings. In general, the estimates are comparable to this study by adding effects of changes to single parameters. This method gives an error margin in the estimates as changes in parameters are not linear and therefore not addable. However the error margin is small. Further, Blondahl *et al* does not apply the actual growth rate of income but use growth in labor productivity. Lastly, they include the value of student support which has been disregarded in this paper's results.

**Age.** Blondahl et al estimates returns across ages for tertiary education. Annex table 8 compares the returns to those found for Colombia. Colombians enjoy returns to tertiary similar to some of the highest yielding countries in the world, the United Kingdom and the United States.<sup>20</sup>

**Annex table 8 –Tertiary Returns to Education by Age in Selected Countries**

	Colombia	US	Japan	Germany	UK	Sweden
Age 40	9.4	8.9	0.9	-1.5	11.1	3.9
Age 45	5.9	6.7	-3.0	-9.7	8.8	0.6
Age 50	-0.8	3.5	-10.5	-23.0	5.5	-7.5

Source: Blöndahl et al 2002 and authors' calculation

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<sup>20</sup> The pattern of high returns to education in Colombia for the adult population mirror those for the young population. Blondahl et al find rates of return for young people ranging from 6 for Germany to 15 for United Kingdom, which places the return in Colombia, 16 percent, as the highest.

**Tuition.** The impact of tuition in Colombia is around 6.5 percentage points for men and 6.3 for women while the impact in the OECD survey on average is 1.5 percent point for men and 2.0 percent point for women. These averages cover a considerable spread of importance of tuition in the OECD sample with a low of 0.1 percent point for Denmark to a high of 6.0 percent point for women in the United States. Annex table 9 shows simple averages for men and women for selected countries. The large differences between countries are largely due to different public policies on support to tertiary education. Colombians have the highest impact of tuition with only the United States coming close.

**Taxes.** Not surprisingly the impact of taxes in Colombia is amongst the lowest. A marginal tax of 12 percent is low compared to OECD countries.

**Unemployment.** Interestingly, Colombia is the only country where excluding the possibility of unemployment reduces the return to tertiary education. This occurs because there is high unemployment amongst secondary graduates in Colombia, the expected income of a secondary graduate therefore increases substantially if unemployment is disregarded and as a result the difference between the expected income of a graduate from secondary education and the income of graduate from tertiary education decreases, and so does the return to tertiary education.

**Annex table 9 Impact of Taxes, Unemployment and Tuition on Tertiary Returns**

	Colombia	US	Japan	Germany	UK	Sweden
(no) Unemployment	-0.80	1.15	0.70	0.95	1.45	1.40
Taxes	-0.50	-2.15	-0.25	-1.55	-2.20	-1.10
Tuition	-6.40	-5.35	-2.20	-0.45	-2.60	-0.75

Source: Blöndahl et al (2002) Table 3 and authors calculations for Colombia.

**Gender.** The difference in returns between genders is also higher in Colombia. The difference is smallest in the United States with less than 1 percent point difference, while Colombia has a difference of almost 4 percentage point. This can be seen in annex table 10 that shows returns for each gender.

**Annex table 10 – International Returns at Tertiary Level**

	Colombia	US	Japan	Germany	UK	Sweden
Men	16.3	12.8	6.6	6.4	14.9	8.4
Women	12.5	12.0	5.9	5.4	12.9	7.5

Source: Blondahl et al (2002) Table 3 and authors calculations for Colombia. Note: Colombia is only urban.